

Claims

We claim:

- 1 1. A method for expanding a RAID subsystem from a first array of disk drives to a
2 second array of disk drives, the first array including a set of data disk drives storing
3 old data and spare space, and the second array including the first array and at least
4 one new disk drive, comprising:
5 distributing the old data among the set of data disk drives and at least one
6 new disk drive while mapping new data to the spare space; and
7 copying, upon completion of the distribution, the new data from the spare
8 space to the set of data disk drives and at least one new disk drive to enable
9 concurrent expansion of the first array while accessing the old and the new data.
- 1 2. The method of claim 1 further comprising:
2 allocating the spare space on a dedicated spare disk drive.
- 1 3. The method of claim 1 further comprising:
2 allocating the spare space among the first array of disk drives.
- 1 4. The method of claim 1 wherein the new data are mapped redundantly.
- 1 5. The method of claim 1 further comprising:
2 initializing the spare space to all zero data.
- 1 6. The method of claim 5 further comprising:
2 generating parity data for the initialized spare space.

1 7. The method of claim 1 further comprising:

2 initializing at least one new disk drive; and

3 generating parity data for the initialized new disk drive.

1 8. The method of claim 1 further comprising:

2 determining parity data for the new data from the new data and the old data.

1 9. An expandable RAID subsystem, comprising:

2 a first array of disk drives including a set of data disk drives storing old data
3 and spare space;

4 a second array of disk drives including the first array and at least one new
5 disk drive;

6 means for distributing the old data among the set of data disk drives and at
7 least one new disk drive while mapping new data to the spare space; and

8 means for copying, upon completion of the distributing, the new data from
9 the spare space to the set of data disk drives and at least one new disk drive to
10 enable concurrent expansion of the first array while accessing the old and the new
11 data.

1 10. The subsystem of claim 9 wherein the spare space is distributed and initialized
2 to zero.

1 11. The subsystem of claim 9 where the spare space is allocated to an initialized
2 dedicated disk drive.